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**Regional Training and Certification Course on
Residence Time Distribution and Column Scanning techniques,
Seibersdorf and Vienna, Austria, from 4 to 15 December 2023.**

Optimal operating conditions of processing units for industry, for example in petrochemicals, wastewater treatment, cement manufacturing, and ore processing, are very important, because malfunctions could lead to an inestimable loss, especially in terms of financial resources. The appropriate application of radiotracer and sealed source techniques processing units in industry can improve quality, productivity, reliability, and safety, also efficiency, reducing, or even, eliminating production downtime and industrial pollution.

To develop capacity in the use of radiotracer technology to improve industrial processes, the International Atomic Energy Agency (IAEA,) in cooperation with the International Society for Radiation Tracers and Applications (ISTRA), successfully organized a regional training and certification course on residence time distribution (RTD) and column scanning techniques at IAEA laboratories in Seibersdorf, Vienna, Austria from December 4-15, 2023. The main objective of the course was the training and certification of radiotracer technology practitioners in level 1 and 2 radiotracer and gamma scanning techniques, according to a recognized training and certification program internationally.

The training course was organized as part of the project regional **“RER1023, Harmonizing Implementation of Radiotracer and Sealed Sources Techniques for Efficient Use of Natural Resources and Environmental Monitoring”** which aims to harmonize and strengthen Member States' capabilities for radiotracers and sealed source technologies as applied in the efficient and sustainable management of natural resources and environment preservation and remediation. 14 participants participated in the course- 11 participants from (Azerbaijan, Bosnia and Herzegovina, Georgia, Greece, North Macedonia, Poland, Romania and Türkiye), and 3 from Angola with the support of TC project **“ANG1005, Using Radiation Technologies as Diagnostic Tools for Industrial Plant Process Performance Optimization and Troubleshooting”**.



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Very competent experts from ISTRA led the theoretical and practical modules for two weeks.



Figure 1. Group photo of participants and trainers.

In the first week, lectures on theory of radiation physics and the basics of radiation protection, methodologies and technologies of radiotracers and gamma scanning among other topics were delivered. The participants had the opportunity to learn about real industrial applications and performed fundamentals exercises using the "Residence Time Distribution (RTD) Version 1.0" software provided. Participants also discovered the diversity of usage and benefits in economics of the techniques in the industry, as well as the importance of the urgent need to promote these techniques in their respective countries.

The second week of the training was dedicated to practical sessions in the laboratory. The column scanning technique was demonstrated using an X-ray generator and a column presenting various internal configurations simulating real situations of a refinery column. The trainees performed the scans and analysed the results obtained to better understand the



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technique, the signal response and how it translates into the different internal configurations of the column.



Figure 2 & 3. Column gamma scanning and data acquisition simulation.

Additionally, the flow rate and residence time distribution measurements were performed on a water flow rig installed in the laboratory. Before the use of the radiotracer FI-18, participants practiced the injections first with potassium permanganate (KMnO_4). Participants then had the opportunity to analyze and interpret the RTD data using appropriate software.



Figure 4. Flow rig.

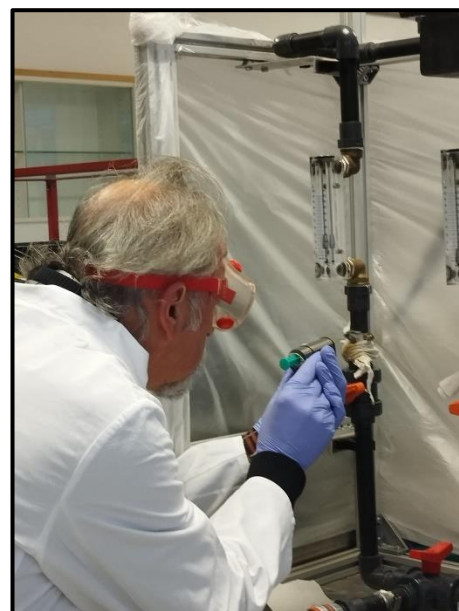


Figure 5. Tracer injection in the system.

The training was concluded with the successful completion of the exam and level 2 certification in SSM/CST and RTM/RTD techniques of the fourteen (14) participants.

Overall, the two-week regional training was very useful and effective. Important knowledge and skills on residence time distribution and column scanning techniques were gained by the participants who are now motivated and qualified to begin promoting and applying these techniques to industries in their home countries, in adding powerful tools to NDT methods already applied in industry.

In the context of quality assurance and accreditation, there is currently a global trend towards the development of level 1 and 2 practitioners in radiotracers and gamma scanners. At national and regional levels, it helps radiotracer groups to promote and introduce radiotracer technology more quickly and easily to their end customers. The process of creating level 1 and level 2 specialists is on course and there is a strong need for certification and training in this domain.

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